

Evaluation of Techniques Used in Dissemination and Management of Electronic Documents in Construction Projects in Tanzania

Godwin Maro¹ and James D. Massawe²

¹Department of Building Economics, Ardhi University, Tanzania

²Department of Building Economics, Ardhi University, Tanzania

Abstract

From the design phase to the construction phase, the construction industry has been extensively associated with large amounts of documents. As a result of increased technological advancement in Information and Communication Technology in the construction industry, the emergence of various improved technological techniques in disseminating and managing these electronic documents becomes inevitable. The evolution of this new and less known dissemination and management technique in construction projects found to encounter some of the problems such as less awareness of these techniques, affordability of the techniques, issue of security, and the legal issues associated with these e-documents. Therefore, a study aimed to determine and evaluate various techniques used to disseminate and manage e-documents to explore challenges facing dissemination and management and recommend appropriate ways to improve dissemination and management of e-documents in construction projects in Tanzania.

The approach to the research was both quantitative and qualitative approach. In this case, twenty (20) construction firms were used as a sample for this study. Purposive sampling was adopted to get the five (5) respondents from consultant firms, and a Simple random technique to get 15 respondents from contractors. Interview and questionnaire surveys were used to collect information from consultants and contractors, respectively. The findings revealed the techniques mostly used for e-documents dissemination and management in Tanzania construction projects are Email and Electronic documents management software. The reason for selecting this technique was the easy accessibility of Email and the capacity of electronic document management software to support mass document input.

Keywords: e-document management, Construction projects

I. INTRODUCTION

Documents In the construction industry have not undergone significant changes since the middle of the 20th century. Plan drawings, bills, specifications, conditions of the contract, etc., have almost the same format as they did some decades ago. The technology for producing, managing, duplicating, and distributing construction project documents has undergone many fundamental changes (Bjork, 2002; Hjelt & Bjork, 2006). In the late '80s and early 90's internet made possible document transfer via mail, which was a significant step for document dissemination and management. This evolution and increased technological advancement made construction companies feel the necessity to improve their means of disseminating and managing the electronic documents generated while executing the contract. According to Rezgui et al., 2010 improving construction services leads to the adoption of various techniques for disseminating these electronic documents, such as when documents are stored centrally on a web server, and users interact with this central repository through interfaces implemented using standard web browsers. Examples of these electronic documents management software that is current and widely used in the construction industry, in general, are Aconex, Procure, Dropbox, Project Group, viewpoint, Isend, builderstorm, and Electronic Document Management System (EDMS) (Bjork, *op. cit.*).

Therefore, traditionally, the construction industry uses the paperwork form of documentation to disseminate and manage construction project documents. Since these form of documentation was found to have so many issues that hinder the efficient dissemination and management of these documents such as time frame for preparation, high cost of producing and managing, Security of the document, Confidentiality of the documents, capacity and accessibility of these documents. It led to the traditional method being slowly out of use but enforced in certain circumstances due to



a number of reasons, such as the contract requirement and the legal connotations of e-documents.

II. STATEMENT OF THE PROBLEM

As a result of increased technological advancement in information and communication technology, these led to the emergence of various improved technological techniques in disseminating and managing construction projects through e-documentation. The evolution to the introduction of this new and less known dissemination and management technique in construction project was also found to encounter some of the problems which mainly become the motives behind this study problem being the awareness of these techniques, affordability of the techniques, security, the capacity of these technologies and the legal issues associated with these e-documents.

The studies intend to determine and explore the application, benefits, relevance, barriers to the widespread adoption of e-documents dissemination, and management techniques in a construction project in Tanzania.

III. OBJECTIVE

1. To evaluate practice for dissemination and management of e-documents in Tanzania construction projects.
2. To explore challenges facing dissemination and management of e-documents in construction projects.

IV. LITERATURE

Technology for managing electronic documents(e-documents) in construction projects has potentially improved for some decades now. These electronic documents in construction projects include;- agreements and conditions of contracts, plans and construction drawings, usually created with a Computer-Aided Design (CAD) and Computer-Aided Modelling (CAM) system, correspondence and emails and quality, health and safety files

Dropbox used as one of the techniques used to disseminate and manage electronic documents in construction projects. A web and client-based software for online Storage of information? The system has several advantages, including simplicity. Users do not need to be trained to use the system, which can be customized for particular construction stakeholders, affordability up to 2gigabites free, maximum guaranteed security to an authorized person only, mass document input. DropBox can be installed on a personal computer (PC), Laptop, and some mobile computing devices such as iPhone, iPad, Android, and

Blackberry phones. According to Nourbakhsh et al. (2012), the system can store, backup, and share the information with multiple users.

Electronic mail, most commonly called Email or email since around 1993 (Ngram, 2013), is a method of exchanging digital messages from an author to one or more recipients. According to Brown (1972) and David (2004), several email types include electronic email web-based emails such as Yahoo, Gmail, and outlook.com. The technique allows consumers to log into the email account to send and receive an email(s). The Internet Message Access Protocol (IMAP) email servers provide features to manage a mailbox from multiple devices. Small portable devices like smartphones are gradually more used to check Email while traveling and replies.

There are challenges associated with using email in the dissemination of electronic documents as the construction projects involve large electronic documents that comprise pictures and text. The challenges include; - capacity of the technique(attachment size limitation), Security (Spamming and computer viruses), Confidentiality, and privacy concerns (Diveley-Coyne, 2000; Allen, 2004; Smallwood, 2012). They further argued that the combination of spam and worm programs results in users receiving a constant drizzle of junk email, which reduces the usefulness of Email as a practical tool. Confidentiality and Privacy concern internet email may travel and be stored on networks and computers without the sender's or the recipient's control. During the transit time, third parties may read or even modify the content. There is a limited capacity attachment size limitation. In most cases, the capacity is limited to up to 25MB.

Construction projects have begun to adopt Online Collaboration Platforms (Project Extranets) Wilkinson (2005) as a means of Dissemination and management of electronic documents. An example of an online collaboration platform in use within the construction industry is Aconex and Procure. An online collaboration platform is an electronic network linking different organizations to exchange information electronically (Briggs & Brumpton, 2001). Documents are stored in an electronic database that contains all the information relevant to the particular project.

Any project participant can access the database at any time and from any place. The database is generally maintained by an external service provider who will have a contractual arrangement with at least one of the project participants (Kamara & Pan 2004). The system associated with some advantages, to mention a few included an large exchange volumes of data using

Electronic Data Interchange (EDI), Share product catalogs exclusively with trade partners, Collaborate with other companies on joint development efforts and jointly develop and use training programs with other companies. Nevertheless, the system also faces some challenges, such as extranets, which can be expensive to implement and maintain within an organization.

Sun's & Aouad's (1999) describe the emergence and usage of Electronic Document Management System (EDMS). An advantage of EDMS helps users to perform their work more comfortably and provides the company with security, data reliability, and work process management (Back & Moreau, 2001). That means it can manage documents and data regardless of originating system or format, the ability to integrate computerized and paper-based systems, control access, distribution, and modification of documents, and provision of document editing and mark-up tools. However, Nitithamyong & Skibniewski (2004) contended that the system has its limitations. It includes information such as letters, reports, databases, drawings, etc., must be in electronic format, either created electronically or scanned in from a paper version. This includes handwritten notes and sketches and large maps and complex drawings on which much of the effort wasted in interfacing with non-compatible systems, particularly paper-based ones. Also, do not allow concurrent working, where several designers work simultaneously on the same drawing.

V. METHODOLOGY

Research Methodology is a systematic way to solve the research problem. This research describes the research design, sampling techniques, data collection, and instruments used to accomplish the study (Kothari, 2004). The approach for conducting this research was a mixed-method, both quantitative and qualitative approaches concerned with assessing attitudes, opinions, behavior, and generalizations of the findings' results (Dawson, 2002 and Kumar, 2010). The research process consists of a series of actions or steps necessary to carry out research and the steps' desired sequencing effectively. The study involved is; pointing out problems facing e-documents dissemination and management, extensive literature review on the technique used for e-document dissemination and management of the advantages and limitation of each of the techniques, developing objectives by determining and evaluating the techniques, data collection on the construction firms, processing the data, data interpretation and discussion of findings and writing a research report.

In this study, the geographical scope to have manageable research matched with the existing constraints such as time, convenience, and resources,

the research was based on Dar es Salaam as the research's case study area. Both probability (systematic) and non-probability (purposive) will be used to select the population (Orodho, 2002; Walliman, 2005). Probability sampling was used to get respondents from class one building contractors. This sample was chosen systematically. The research also uses simple random sampling to obtain the data; the researcher picks a list of contractors from the Contractor Registration Board (CRB) and chooses class one contracting firms whose office is randomly in Dar es Salaam to obtain a sample size of 15 randomly. For this research, the first approach was used and specified to determine the sample size based on the level of precision, confidence, and degree of variability in the attribute study. According to Olive and Abel (1999), in social science research, the following formula can determine the sample size.

$n = Z^2 (pq/d^2)$; Whereby n =the desired sample size (If the population is greater than 10,000), Z =the standard normal deviate at the required confidence level=the population in target population estimated to have characteristics being measured= $1-p$, d = the level of the significant statistical set.

If the target population is less than 10,000, the required sample will be smaller. In such cases, calculation of the final sample estimate (nf) using the following formula: $nf = n/(1 + n/N)$, where; nf = the required sample size, n = the desired sample size (where the population is less than 10,000); N = the estimate of the population size. From existing records of the contractor's registration board (CRB) and AQRB, 67 class one building construction companies located at Dar es Salaam registered (CRB and AQRB, Contractors and consultants directory, 2015). As the researcher couldn't collect information from all companies within time and money constraints, the desired sample is 15 for respondent's contractors five (5) respondents from a consulting firm. Therefore, the required total sample size for this study is 20.

The other respondent from building consultant firms were deliberately (purposive sampling) selected using a non-probability sample because they are few (population). A sample of 5 building consultants selected for this purpose. The consultant firms selected was One (1) public own firm and four privately owned firms.

The data collected through questionnaires and face-to-face interviews with the individuals working in building construction organizations in Dares Salaam. Research questions focus on the identification of techniques used for e-documents dissemination and management in construction projects, reasons for selection of these

techniques, functions accomplished by these various technique for e-documents dissemination and management, costs associated with implementing these techniques, and finally challenges and recommendations on techniques used for e-documents dissemination and management in Tanzania construction projects. The questionnaires have almost closed-ended questions that will require a specific response. Few open-ended questions were designed to get an opinion on some other issues facing e-documents dissemination and management and get a suggestion on improving the usage of techniques for e-documents dissemination and management.

The response rate was 17 out of 20, generally from the construction industry. In a nutshell, the questionnaire and interviews' responses were reasonably good enough to represent the findings, conclusion, and

recommendations to the research. Data collection from the interview was opted by the researcher to supplement information from the questionnaire and obtain technical information from the interviewee. Out of 5 planned interviews, 3 of them interviewed, which equates to 60% of the planned interviews. Data were analyzed and processed through word format presented into texts mainly for descriptive purposes, while tables and figures supported the analytical presentation.

VI. RESULTS

A. Project Characteristics

In this section, the researcher aimed to determine the types of projects whereby techniques for e-documents dissemination and management were mostly applied, their frequency, and the techniques used on particular projects. The results were as shown below;

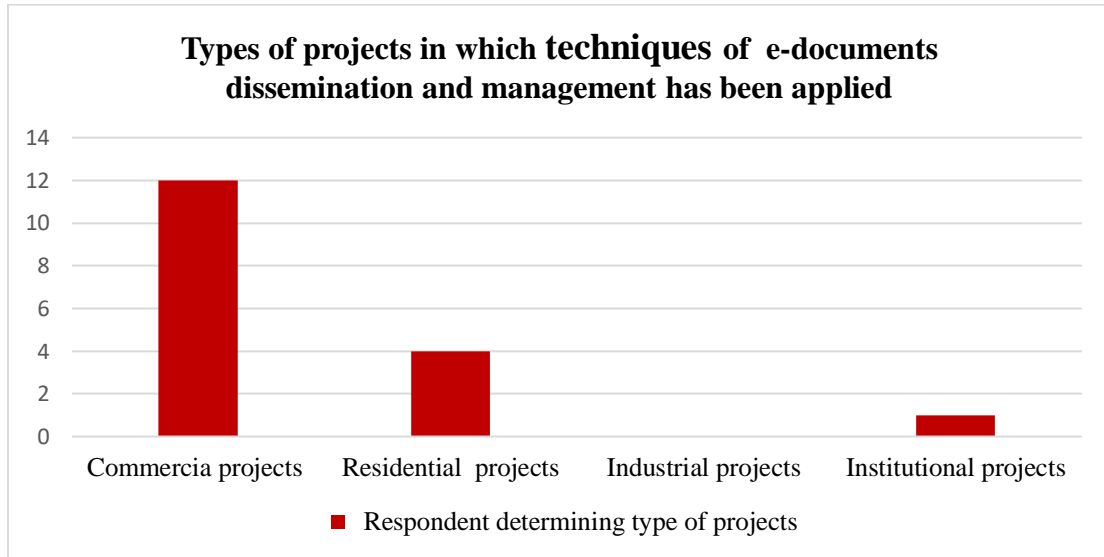


Figure 1: Types of Projects in which techniques for e-documents dissemination and management applied.

From the figure above, the response showed that the type of projects in which techniques for e-documents dissemination and management applied were commercial building projects that cost over 5 billion Tshs. However, 4 of the respondents replied that they had asked for e-documents dissemination techniques in some residential projects. Furthermore, the industrial buildings had zero response concerning the use of techniques for e-documents dissemination and management in their projects. In contrast, 1 of the respondents had used the techniques on institutional projects. This means that it is likely in Tanzania construction projects that commercial projects that cost a large amount of money starting from 1 billion are the ones that are highly involved with the implementation and application of these techniques for e-documents dissemination and management. Furthermore, the type

of techniques employed or used on a particular project \will depend on the requirement and project value/ cost. Conclusively, the techniques for e-documents dissemination and management are employed in Tanzania construction projects.

B. The technique used in dissemination and management of e-documents.

The respondents were required to state which technique they use to disseminate and manage their e-documents in executing their projects. This question aimed to get knowledge on which technique is mostly used in construction projects in Tanzania how the firm's owners address the needs of using a certain technique on a particular project. The question had different answers for different respondents, as follows.

Table 1.3 Technique used in dissemination and management of e-documents.

Mostly used=3, moderately used=2 and Not at all=1

S/N	Technique	Mostly used	Moderately used	Not at all	Mean= $M=\frac{\sum(FxS)}{N}$	Rank
a	Dropbox	2	4	11	1.47	4
b	E-mail	6	11	0	2.35	1
c	Collaboration platforms (Projects Extranets) Example Aconex, Procore.	4	2	11	1.59	3
d	Electronic document management software's	9	4	4	2.29	2

Source: (Author, 2019)

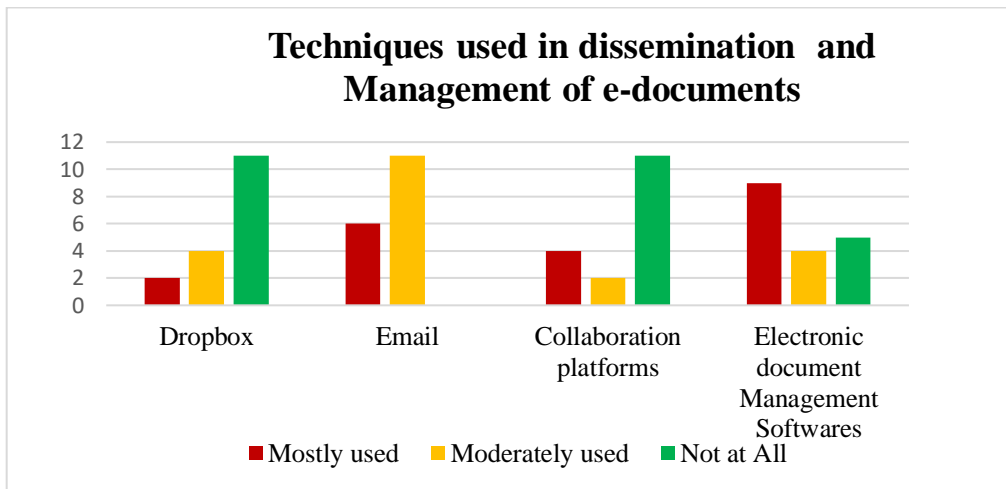


Figure 1.2: Showing which techniques mostly used in e-documents dissemination and management in Tanzania construction projects

Figure 1.2 above shows which technique is mostly used in e-documents dissemination and management in Tanzania construction projects, whereby 9 respondents out of 17 indicate that they mostly used electronic document management software's for document dissemination and management.

Furthermore, the result shows that 6 respondents out of 17 admit they mostly used Email as their tool or technique to disseminate e-documents. However, 11 of respondents indicated that they moderately used this technique, and nil of the respondent stated that they don't use the technique.

Moreover, 4 respondents admit that they mostly used collaboration platforms (Project Extranets) in e-document dissemination and management. In contrast, 2 respondents show that they moderately used the technique and 11 respondents indicate they do not use it. Additionally, 2 of the respondents indicated that they mostly used Dropbox as their primary technique

for e-documents dissemination. In contrast, 4 of the respondents mentioned that they moderately used the technique and the 11 respondents admit that they do not use the technique at all.

Conclusively, the results have displayed that Electronic document management software's is the technique which is mostly used for document dissemination and management in Tanzania construction projects; however, the average between those respondents who mainly used and those who do not use the technique indicated that Email is the leading technique used in dissemination and management of e-documents.

C. Reasons for Selection of a Certain Technique e Used in E-Documents Dissemination and Management.

The researcher aimed to determine what motivated the firms to adopt a particular technique and decide to use it in their projects as the tool for e-documents dissemination and management. The

following were the responses. Since the technique mostly used was Electronic documents management software developed by Email, the following table shows

the significant reasons for driving them to adopt this technique.

Table 3.3. Respondents Determining Reasons for Adoption of a Certain Technique.
Agree =3Neutral, =2 and Disagree =1

S/N	Reasons	Agree	Neutral	Disagree	Mean= $M=\frac{\sum(FxS)}{N}$	Rank
a)	Affordability	6	8	3	2.18	4
b)	Highly Secured	9	8	0	2.53	3
c)	Confidentiality and Privacy concerns	9	8	0	2.53	3
d)	Easily Accessible	15	2	0	2.88	1
e)	Mass document Input	13	4	0	2.76	2
f)	Document Template	5	4	8	1.82	5
g)	Language Independence	0	11	6	1.65	6

Source: (Author, 2019)

The results showed that easy accessibility of the techniques was ranked first with an average mean score of 2.88, which means most of the users of these techniques prefer the use of that technique that will be easily accessible at any time when the documents are needed and at any place that will be convenient

selected as fifth having an average mean score of 1.82 is the language independence of the technique with an average mean score of 1.62.

Furthermore, the technique which supports mass document input comes second with an average mean score of 2.76 since large projects involve a large amount of e-document; the results reveal that the technique which can accommodate a maximum number of the document will be favorable over the other. The technique's high security, Confidentiality, and privacy concern come third with an average mean score of 2.53. The results show that it is also an important aspect the firms look at before selecting a certain technique used in e-document dissemination and management.

Therefore, the results have displayed that the main reasons for selection of specific technique to be used in e-documents dissemination and management in construction projects of a firm are easy accessibility, mass document input, high security and confidentiality and privacy concerns of the technique as a large number of respondents supported these reasons.

Additionally, the affordability of the technique comes forth with an average mean score of 2.18. In contrast, the technique that allows for the document template

D. Functions of Techniques Used in E-Documents Dissemination and Management in Construction Projects.

Respondents were required to state the most critical functions that the technique was selected when used in construction projects. The researcher aimed to understand if any specific features are required for the technique decided. The following were the functions of this technique as given by the respondents.

Table 1.4. Functions of techniques used in e-documents disseminations and management.

S/n	Functions	Agree	Neutral	Disagree	Mean	Rank
a)	Storage	13	4	0	2.76	3
b)	Documents Sharing	15	2	0	2.88	2
c)	Compatibility with BIM and other software's	4	6	7	1.82	6
d)	Documents Retrieval	17	0	0	3.00	1
e)	Mass document Input	5	7	5	2.00	5
f)	Life cycle versioning of the document	9	8	0	2.53	4

Source :(Field data, 2019)

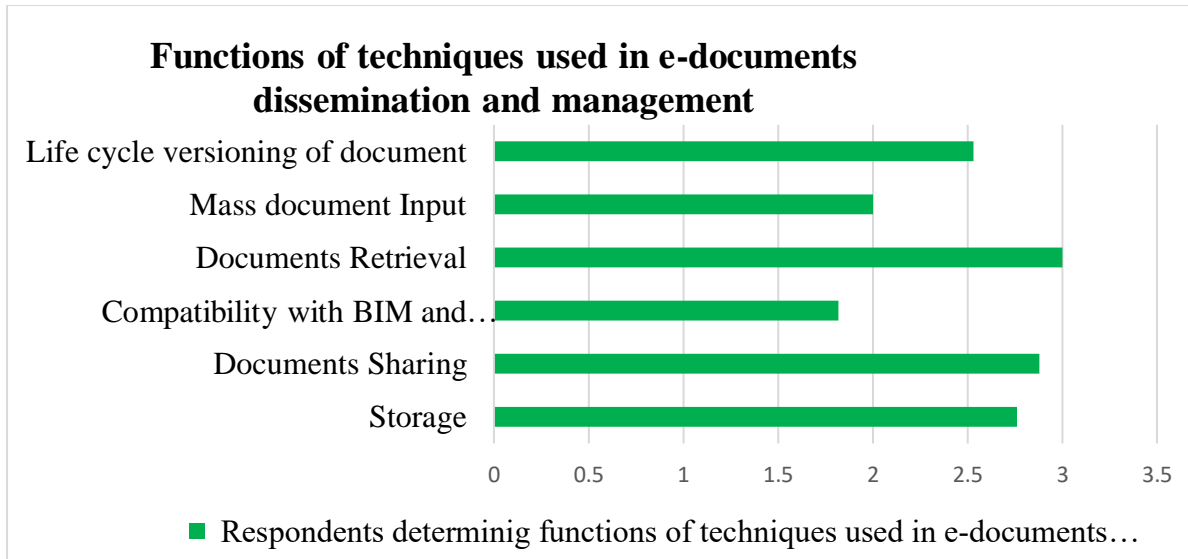


Figure 1.4: Showing respondents determining functions of techniques used in e-documents dissemination and management.

Figure 1.4 shows that the main functions achieved by techniques used in e-documents dissemination and management were mainly four as follows;- the first most common function performed by these techniques was documented retrieval with an average mean score of 3.0. Stored the documents uploaded on it. Fore stance these technique saves its document on cloud storage then the process of document retrieval will depend on the availability and speed of network provided.

Furthermore, the functions of documents sharing come second with an average mean score of 2.88. The techniques were found to support these functions of document sharing among the project's participants to facilitate the efficient communication of project information. Moreover, the storage function of these technologies comes third with an average mean score of 2.76. This means the technique was able to support the Storage of these e-documents to an individual a limit. However, the techniques were supposed to allow the maximum storage space to accommodate all e-documents of a project.

Additionally, the life cycle versioning of documents comes fourth with an average mean score of 2.53.

of 3.0. The techniques seem to meet these function of fastening the process of document retrieval whenever they are required. This process is much dependent on where the technique

Lastly, it is followed by mass document input and compatibility with other BIM (Building Information Modeling) software's functions, both with an average mean score of 2.0 and 1.82, respectively.

Conclusively the result has displayed that the first, second, and third functions are the ones that are effectively achieved by the techniques selected by the firms in dissemination and management of e-documents in Tanzania construction projects. Therefore, construction firms need to opt for more efficient techniques such as Collaboration platforms.

E. Cost Involved In Implementing E-Documents Dissemination And Management Techniques.

Respondents were required to state the additional cost they always incurred when implementing e-documents dissemination and management techniques. The researcher aimed to identify the other costs of implementing these techniques in construction projects. The results are tabulated in the following table.

Table 1.4 Cost involved in implementing e-documents dissemination and management techniques.
 Mostly used=3, moderately used=2 and Not at all=1

S/N	Costs involved	Number of the respondent whereby Total number N=17			Mean= $M = \frac{\sum(FxS)}{N}$	Rank
		Mostly	Moderately	Not at all		
a.	Increased cost for labor	0	4	13	1.24	6
b.	Increased equipment maintenance cost	0	11	6	1.65	4
c.	Increased equipment rental expenses	0	0	17	1.00	7
d.	Cost of additional equipment's/ materials	1	8	8	1.59	5
e.	Increased field supervision	2	9	6	1.76	2
f.	Increased job site expenses	2	11	4	1.88	1
g.	Subcontractor costs	2	9	6	1.76	2
h.	Increased overheads expenses	4	8	5	1.71	3

Source :(Author, 2019)

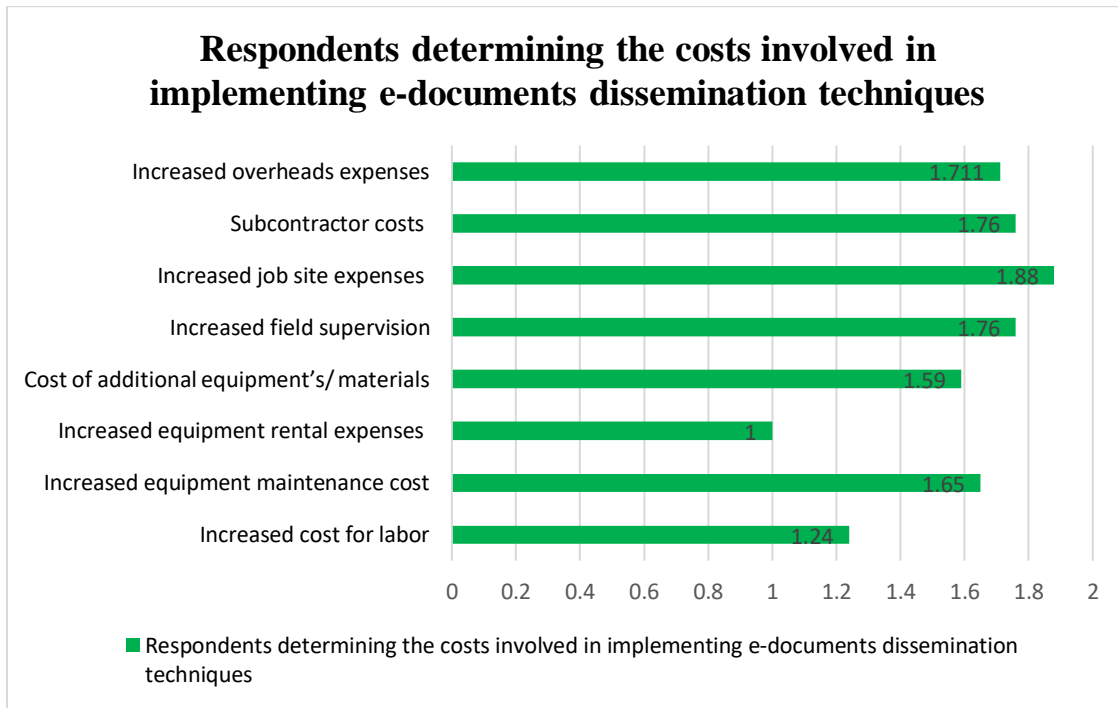


Figure 1.4 Showing respondents determining the costs involved in implementing e-documents dissemination and management techniques.

The figure above shows the main additional costs which are involved in implementing e-documents dissemination and management techniques. Increased

job site expenses come first with an average mean score of 1.88. The average mean score tends to be low since most respondents did not agree that the job site's

expenses increased by implementing these techniques. Furthermore increased field supervision costs and subcontractor cost comes second with an average mean score of 1.76.

Additionally, increased overhead expenses and increased equipment maintenance cost come third with an average mean scorer of 1.65. These and the above describe cost are the ones noticed by the respondent to increase slightly.

Conclusively, the result has displayed that the additional cost of implementing some of the techniques is slightly higher than the project's value. Although some of the techniques, if used in

the projects, have remarkable cost that can be noticed. For example, the collaboration platforms require the construction firm to enter into a real contract with these collaboration platforms; however, if this technique is implemented, the main additional cost is determined by the respondent, as mentioned above.

F. Challenges Facing the Usage of Techniques Used In E-Documents Dissemination and Management

The respondents were asked to give out the challenges facing the use of techniques used in e-documents dissemination and management. The responses were as given below in the table

Table 1.5.Challenges facing the use of techniques used in e-documents dissemination and management Mostly used=3,

S/n	Challenges	Mostly	Moderate	Not at all	Mean	Rank
a.	Low knowledge and skills of using e-documents dissemination and management techniques	8	8	1	2.41	1
b.	High training cost on the usage of this technique	2	11	4	1.88	5
c.	The huge cost of running and buying the software's	3	8	6	1.82	6
d.	Slow internet speed in some of the places	6	9	2	2.23	2
e.	The inflexibility of the construction project to change with technology	2	11	4	1.88	5
f.	Legal issues associated with these techniques	6	6	5	2.06	3
g.	Lack of awareness of benefits of e-documents dissemination and management techniques.	2	13	2	2.00	4

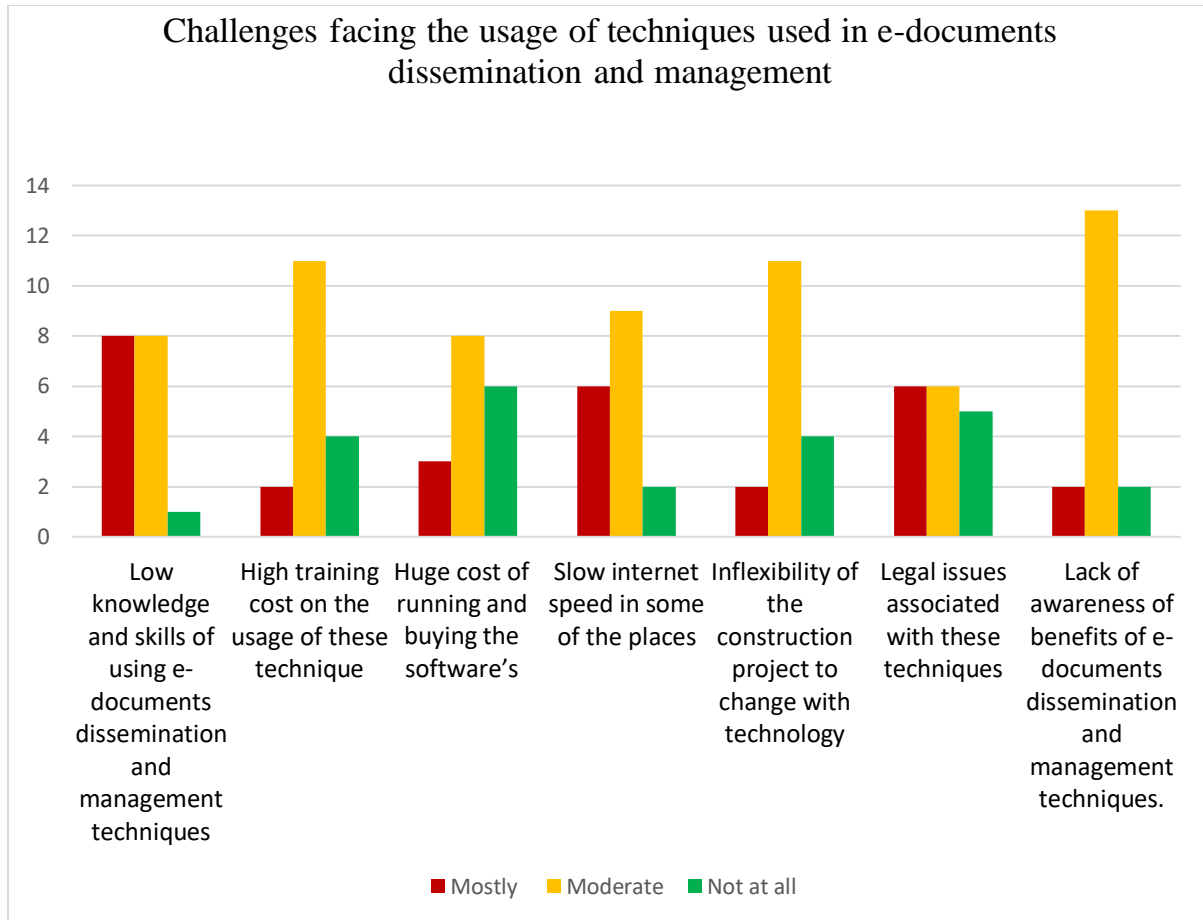


Figure 1.5. Showing respondents determining the challenges facing usage of e-documents dissemination and management techniques.

The figure above displaying the main challenges facing the use of the techniques as follows;- a low knowledge and skills of using e-documents dissemination and management technique. Also, some of the participants of the project may be aware and possessing the required knowledge while the other participant may not be aware and yet not willing to use the technique according to respondent these imply that technique which requires specific knowledge of using that particular technique hence.

Furthermore, since the usage of this technique they much dependent on the availability of a network with a reasonable speed, these come second as the main challenges, especially when the projects executed in remote areas where most of the time, the network tend to be the problems especially in enhancing document retrieval and sharing functions.

Also, the results show that the legal issues associated with e-documents dissemination and management techniques come third with an average mean score of 2.06. The respondent had pointed out these to be one of

the main challenges, especially when the project's participants at first they did not put any agreement on means of communication of project information before the usage of the technique for e-documents dissemination and management. Moreover, Lack of awareness on the benefits of e-documents dissemination technique, the inflexibility of the construction industry to change with technology, and the huge cost of buying and running the software's come lastly with an average means score of 2.00, 1.88, and 1.82, respectively.

Another pointed challenge was the inflexibility of the Tanzania construction industry to change with technology as it shows that they are reluctant the adoption of the more sophisticated technique. The collaboration platforms for dissemination and management of e-document technique provides for a more efficient and reliable technological way for e-document dissemination and management, whereby project information communication attained effectively.

Conclusively concerning the firms questioned found that the main challenges facing e-documents Three. These are low knowledge and skills of using e-documents dissemination and management techniques, Slow internet speed in some of the places or network in some of the remote areas where construction projects are carried out, and the legal issues associated with the dissemination and management of the documents. The legal issues tend to be one of the challenges which

G. Views on What should be Done to Improve the Usage of E-Documents Dissemination and Management Techniques.

The respondents were required to give out their views on what should be done to improve the use of e-

dissemination and management technique are mainly frequently facing this technique, especially when using other technique rather than collaboration platforms for e-document dissemination and management since the legal issues are not put clearly among the project's participant on the particular technique as the means of communication of project information.

documents dissemination and management and to give their suggestions. The responses are tabulated in the table below.

Table 1.6. Views on what should be done to improve the usage of techniques used in e-documents dissemination and management.

S/n	What should be done	Agree	Neutral	Disagree	Mean	Rank
a)	Ensure project participant has the same interface for viewing e-documents	13	2	2	2.65	1
b)	Settings standards for a participant who want to implement these techniques in their project	11	6	0	2.65	1
c)	Ensure project participants uses the latest version of these e-documents software's	6	9	2	2.24	3
d)	To conduct seminars on construction practitioners on the usage of these e-documents	4	9	4	2.47	2
e)	To put clearly understanding of the legal issues associated with e-documents among project participants.	11	6	0	2.65	1

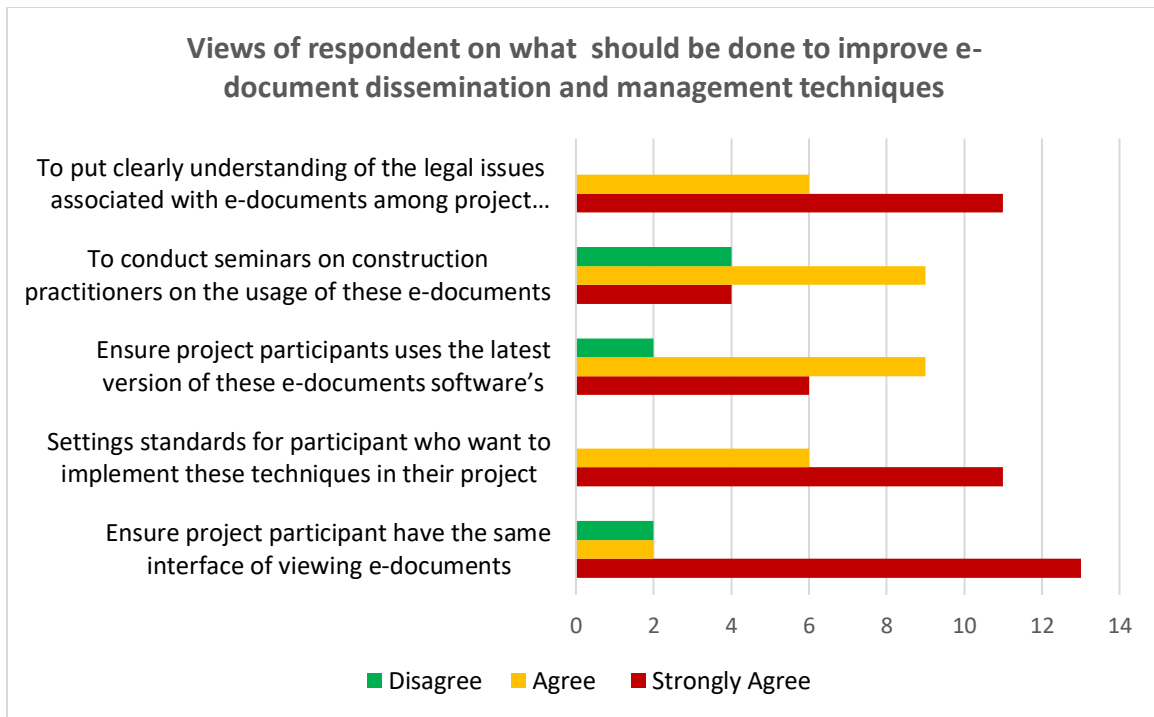


Figure 1.6 Showing respondent views on what should be done to improve the usage of e-documents dissemination and management techniques.

The figure above displaying the respondent's view on what should be done to improve the usage of the technique concerning respondent views. Ensure project participant has the same interface of viewing e-documents, settings standards for the participant who want to implement these techniques in their project and to put the understanding of the legal issues associated with e-documents dissemination among project participants. First was an average mean score of 2.65, while to conduct seminars on construction practitioners on the usage of these e-documents comes second with an average mean score of 2.47.

Conclusively, the results have shown that the most common things that should be done to improve techniques for e-documents dissemination and management ensured project participant has the same interface of viewing e-documents, settings standards for participant who want to implement these techniques in their project and to put clearly understanding of the legal issues associated with e-documents among project participants

VII. CONCLUSION

Concerning the results provided by respondents to the objectives of this study as mentioned in the research questions, the research has recognized some fundamental issues on the use of techniques for e-document dissemination and management in Tanzania

construction projects. As a result of this are those issues as explained concerning their matters.

A. Techniques Used for E-Document Dissemination and Management in Tanzania Construction Projects

As discussed earlier in the previous chapter, findings reveal that the techniques mostly used for e-documents dissemination and management in Tanzania construction projects are Electronic document management software and Email. These techniques are the ones most commonly used in spite of having various shortcomings.

B. Reasons behind the Selection of E-Documents Techniques for Dissemination and Management of Construction Projects

The main reasons behind the selection of the above techniques are easy accessibility of this technique and the ability to support mass document input for electronic document management software technique. The use of email has become most favorable for document dissemination only since it can easily access anywhere through the use of mobile phones and iPad and does not support mass documentation. However, other reasons such as security of the technique and confidentiality issues have also been taken into consideration in the selection of techniques as the tool for e-documents dissemination and management.

C. Functions Performed or Achieved by the E-Documents Techniques Selected.

The results showed that the functions supported by this selected technique are mainly three, which are document retrieval, documents sharing, and Storage of these e-documents. Other functions like life cycle versioning of document, compatibility with other building information modeling software's and document template are either partially supported or not supported at all.

D. Costs Involved in Implementing the Selected E-Documents Technique for Dissemination and Management of Construction Projects

Costs that tend to be associated with the implementation of e-documents dissemination and management for the selected techniques are found to be slightly higher as expenses, especially in comparison with other construction projects costs. Such as the cost of materials or labor cost; however, these slightly additional costs are found to increase the following costs increased job site cost, increased field supervision cost, subcontractors cost, an additional cost of overheads expenses.

E. Challenges Facing the Usage of Techniques Used for E-Documents Dissemination and Management

The most common challenges facing the techniques used for e-document dissemination and management in Tanzania construction projects are low knowledge and skills of using e-documents dissemination and management, slow internet speed in some of the places, and the legal issues associated with these techniques.

VIII. RECOMMENDATIONS

As pertaining to the research, the following are the recommendations;

A. Ensuring the Project's Participants Have the Same Interface for Viewing E-Documents.

The users of these techniques have to ensure that the project's participant has the same the interface for viewing these e- documents to avoid the confusion which might arise as A result of using a different version of these techniques.

B. Settings Standards for a Participant Who Wants to Implement E-Documents Technique in Their Projects.

The users of this technique have to agree and set standards pertaining to the usage of this The technique the users have to decide on the application of this technique if they are going to use this technique in their projects.

C. Clearly Understanding of the Legal Issues Associated with E-Documents Dissemination and Management among Projects Participant.

The usage of the techniques for e-documents dissemination and management has risen a concern on legal issues associated with e-documents. The validity of these e-document disseminated and management technique seems to be a problem since these documents can easily be altered when disseminated. It's essential for the project team to be well aware of the legal issues associated with the usage of this technique.

D. To Conduct Seminars on Construction Practitioners on the Usage of E-Documents.

The project participants should make sure that the project team member has reliable Knowledge of the usage of this technique through these seminars, the team members can get a great understanding of the usage of these techniques.

REFERENCES

- [1] Allen, D Windows to Linux, Prentice-Hall.,(2004).
- [2] Back,W.E.,& Moreau, K. A. Information management strategies forproject management. Project Management Journal, 32(1), (2001),10-19.
- [3] Berning, P. W., & Diveley-Coyne, S, E-commerce and the construction industry: the revolution is here. Industry Reports Newsletters provided by the Construction Web Links (HTTP://www. Construction web links. Com/Resources/Industry Reports_ Newsletters/Oct_2_2000/e-commerce.htm),(2000).
- [4] Bjork B-C, The Impact Of Electronic Document Management On Construction Information Management, International Council for Research and Innovation in Building and Construction, CIB w78 conference 2002, Aarhus School of Architecture,(2002),12 – 14.
- [5] Briggs I. & Brumpton, S., Embrace E-Construction With Care!' Australian Construction Law Bulletin, 13(4),(2001), 25.
- [6] Dawson, C. Practical Research Methods. New Delhi:UBS Publisher's Distributors.,(2002).
- [7] Dawson, E. P., Christensen, S. A., Foo, E., Josang, A., Gauravaram, P. S., O'Shea, K. L., & McNamara, J. Electronic Contract Administration–Legal and Security Issues Literature Review.,(2006).
- [8] Google Ngram Viewer. Books.google.com. Retrieved 2016-05-21.
- [9] Hjelt, M., & Björk, B. C. Experiences of EDM usage in construction projects. Journal of Information Technology in Construction (ITcon), 11(9), (2006),113-125.
- [10] Kamara, J. & Pan, D.Y.H. (2004),Virtual Collaborative Design, Construction Information Quarterly, 6(2),170.
- [11] Kombo, D, and Tromp, D, Proposal and Thesis Writing: an Introduction, Nairobi (Kenya): Pauline Publications Africa., (2006).
- [12] Kumar, R. Research methodology- A step by step guide for beginners. New Delhi: SAGE.,(2010).
- [13] Löwnertz, K., Change and Exchange – Electronic Document Management in Building Design, Licentiate Thesis, Dept. of Construction Management and Organization, Royal Institute of Technology, Stockholm, Sweden.,(1998).
- [14] Nitithamyong, P., & Skibniewski, M. J. Web-based construction project management systems: how to make them successful?. Automation in construction, 13(4),(2004),491-506.

- [15] Nourbakhsh, M., Zolfagharian, S., Zin, RM & Irizarry J., IACSIT International Journal of Engineering and Technology, 4(4),(2012).
- [16] Orodho, A.A, Research Methods. Nairobi: Kenyatta University, Institute of Open Learning.(2002).
- [17] Rezgui, Y., Hopfe, C. J., & Vorakulpipat, C. Generations of knowledge management in the architecture, engineering, and construction industry: An evolutionary perspective. *Advanced Engineering Informatics*, 24(2), (2010),219-228.
- [18] Smallwood, R. F. Safeguarding critical e-documents: implementing a program for securing confidential information assets. John Wiley & Sons.(2012).
- [19] Walliman, N. Your Research Project, A step guide for first time Researcher". 2nd edition sage publications in London,.(2005).
- [20] Wilkinson, P., Construction Collaboration Technologies: The Extranet Revolution, Taylor & Francis, London; New York., (2005).